parently photometric, 18 (11%) possibly photometric, 17 (11%) had thin cirrus and 10 (6%) had thick cirrus. We are currently finalising the analysis of the standard stars observations to confirm the number of "true" photometric nights.

The statistics on the seeing is based on 116,761 ASM data points, each averaging one minute of measurements. The median seeing in P63 was 0.76". The seeing was better than 1" 72% of the time, and better than 0.5" 13% of the time.

You may have heard that sometimes the seeing measured by the instruments on Antu is better than the outside seeing. Discounting wavelengths effect (i.e. yes, it is true that ISAAC with its 0.15″ pixels sometimes undersamples the atmospheric PSF), we have indeed seen this effect. It is however fairly rare, and needs special circumstances (in particular, the appropriate wind speed, a pointing such that the wind can flush the primary at the right angle, and an excellent seeing to start with). On some occasions, in service mode, we have had enough programmes in the queue that we could choose to observe in the right direction, and so took advantage of this. In general, however, and especially in visitor mode, it is an unlikely occurrence.

Operations Statistics

ISAAC was used 73 nights, or 40% of the time. FORS1 was used 110 nights. This reflects in part the instrumental problems described above, in part the actual time allocation (or the user preferences).

Once one discounts the downtime, there were 1484 available "observable" hours. Of these, 651 were used for FORS1 and 403 for ISAAC. This results in a total "shutter open" efficiency of 71% (see Figure 1). In period 63, the archive "ingested" 19,794 ISAAC frames and 24,039 FORS1 frames.

In Service Mode, we had 75 accepted programmes (40 in category A, 19 in B and 16 in C, or 40/19/16 for simplicity). The completion statistics is 34/16/11 (of which 13/10/8 are partial completions, usually meaning that most of the programme was carried out, the remainder being impossible to observe because of target RA or non realised constraints etc). The programmes not initiated were 0/3/5. The remainder (6/0/0) are category A open programmes that the Director General has allowed to carry over into Period 64 so that they can be finished.

The success of the first six months of operations is the result of the commitment and professionality of a very large number of people, both in Europe and in Chile. Naming all of them would look very much like the ESO internal organigram! However, I would like to mention at least the Science Operations Team at Paranal (now under the leadership of Gautier Mathys), the Paranal Engineering Department (Peter Gray), the User Support Group (Dave Silva) and the Data Flow Operations Group (Bruno Leibundgut) for their dedication and enthusiasm, and for their crucial contributions. Jason Spyromilio and his team delivered fully commissioned telescope and instruments. Massimo Tarenghi as director of Paranal provided oversight and direction to the whole process.

Special thanks to Jason, Gautier, Dave, Chris Lidman and Jose Parra for providing the statistics in this article.

E-mail: rgilmozz@eso.org

Configuration Management of the Very Large Telescope Control Software

F. CARBOGNANI, G. FILIPPI, P. SIVERA, ESO, Garching

1. Introduction

One of the elements of the success of the development, integration and commissioning of NTT, VLT and the attached Instruments has been the Configuration Management of the related Control Software. It has been based on the Code Archive and the VLT Software Problem Report (VLTSPR) procedure.

2. Code Archive

The code archive supports code configuration during development *and* integration on geographically distributed sites. The design keys are the following:

• The configuration item is the software module. This allows a reasonable but still simple flexibility in system configuration (a system is made up of 15 to 100 items, identified by their name and version, corresponding to 2000 to 20,000 files). Each module is a set of files organised in a fixed directory structure and has a unique name. Figure 1 gives the modules divided by VLT common software and applications.

• There is only one central archive. Users get local copies using a simple client server mechanism. In our projects, there is typically only one person at a time dealing with a specific part. A modification must be started, implemented and tested, then archived. During this period the module is locked.

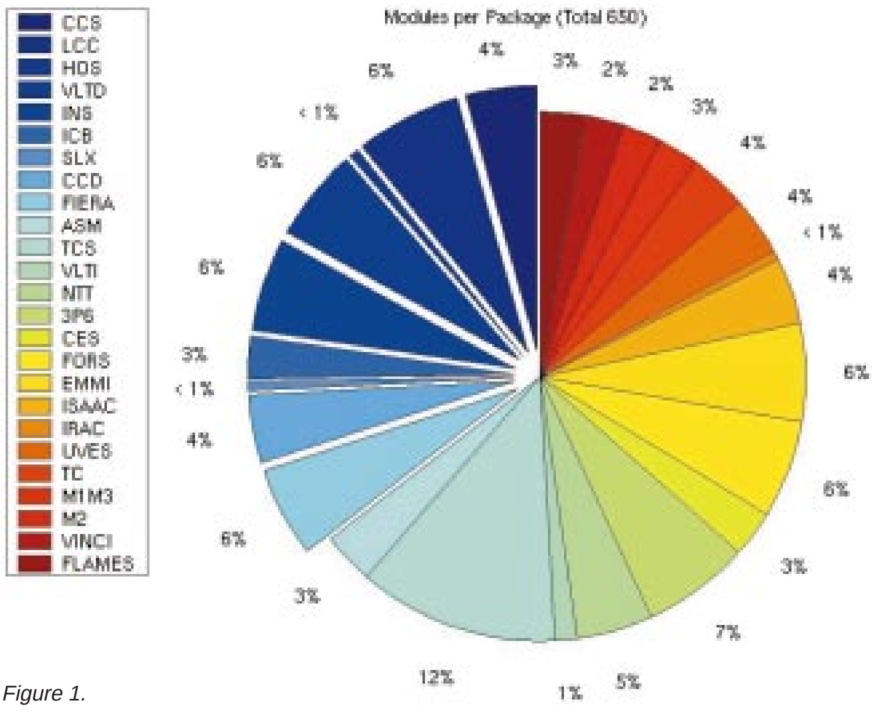

Figure 1.

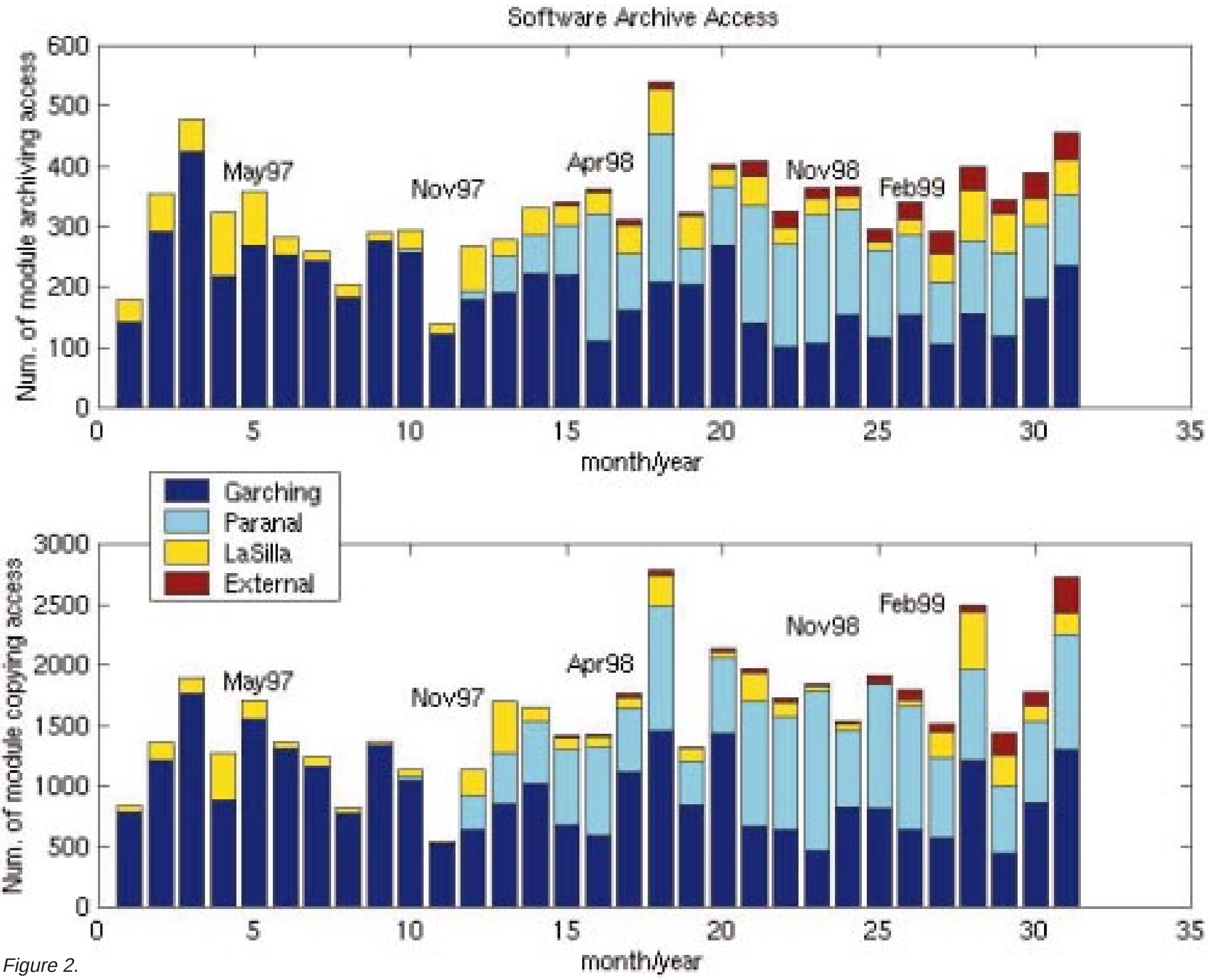

Figure 2.

• To allow experiments or patches on older versions, branches are also supported.

The code archive is implemented using RCS and a set of *ad hoc* programmes and scripts (cmm) implementing the client-server interaction and the user interface. The archive is physically located at the headquarters and used also by teams in Chile and several institutes.

Figure 2 gives the accesses per month for modification and for read-only mode. Currently approximately 60% of the accesses are from outside the headquarters and 25% from non-ESO sites. It can be remarked that the system was able to deal with more than 500 archive and 2500 read-only monthly accesses.

Figure 3 shows in detail the access made by non-ESO sites.

The central archive is not only the software repository, but it is also a management tool. In archiving a module, the developer tells all the other people "Hey, there is a new *consistent* and *tested* set of files that you can use!". This is very useful when several teams operating on different time zones do development and integration. Comparing the current configuration against the status of the

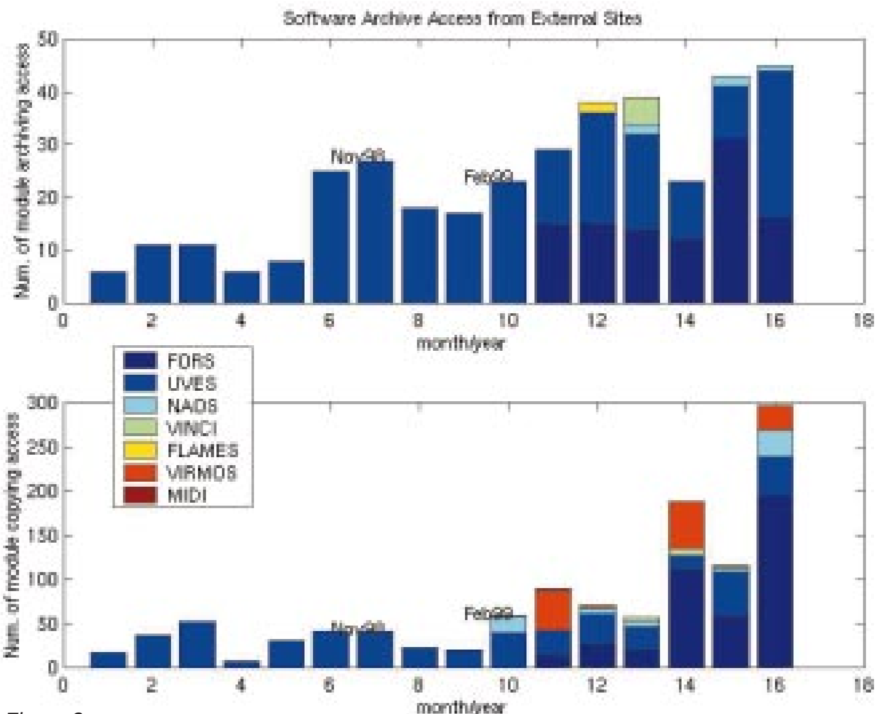

Figure 3.

archive, the integration responsible can see that new items have been produced. A glance to the comments stored by the developer to qualify the newly archived version is normally enough to decide whether to take the new version or not. In this way NTT, VLT and instruments have been developed, integrated and

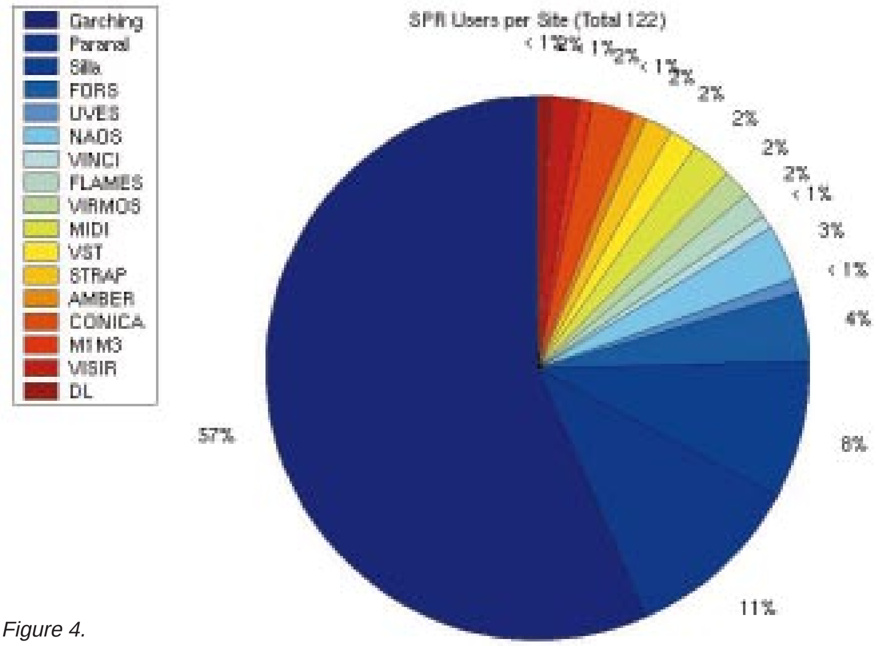

Figure 4.

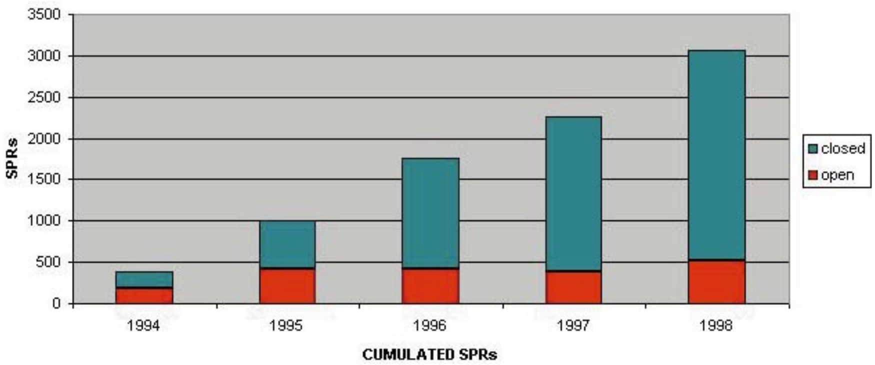

Figure 5.

commissioned on top of mountains at 2500 m in the middle of a desert, but involving people in several countries on both sides of the ocean. The Central Archive is hosted on a RAID system level 5, with hot-standby disk, and backed up in two different ways every day. This year the downtime of the server has been less than 8 days, corresponding to 2%, mainly during weekends. We are developing a better client-server mechanism and we plan to make the cmm software available on the public domain.

3. VLT Software Problem Report (VLTSPR)

The VLTSPR System is meant to be used by both internal and external users of VLT software to report errors in code or documentation or to propose a change. VLTSPR is built using the commercial tool Action Remedy (c) and has a Web Browser interface. This is the basic workflow of the system:

- Problem submitted, depending on the subject, some people are notified immediately
- The SPR is discussed in the Software Configuration Control Board meeting and a Responsible Person is appointed for the problem
- Responsible works on problem
- Responsible can close the SPR (must add a final remark on it)
- People can add comments any time.

At present there are about 120 names in the user database, 75% ESO users (both Europe and Chile), the remaining 25% from 13 external projects, some project have more sites. Figure 4 shows the present distribution of the VLTSPR users.

In Figure 5 the trend of the SPR archive over the years is shown. The number of open SPRs has always been kept under a physiological limit (about 500) that corresponds to what we are able to treat between two releases.

Figure 6 reports the distribution of the SPRs per area in 1997 and in 1998. As the project evolved, SPRs concerning the common software are decreasing, while the ones for the application part are going up, which is a sign of the integration activity that is now taking place.

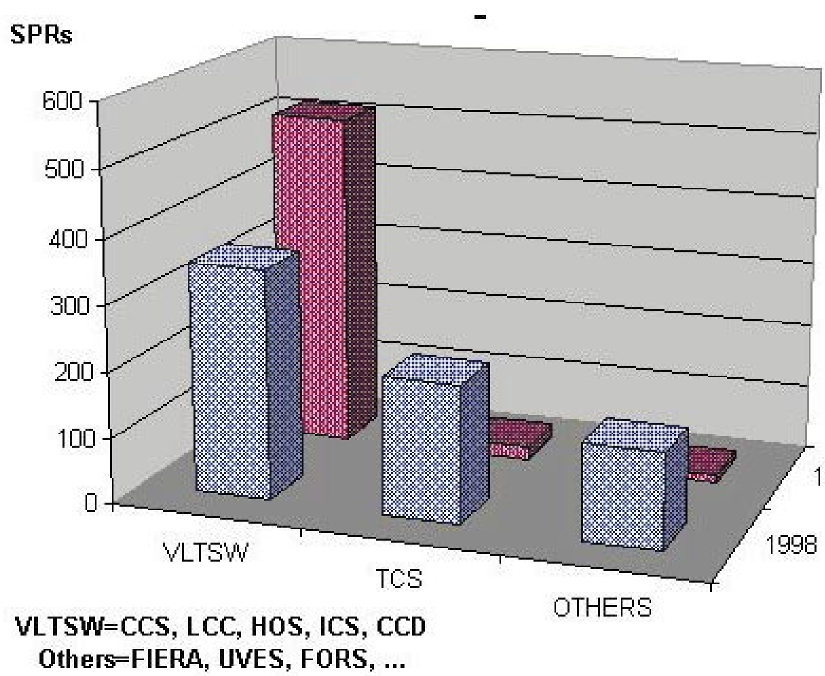

Figure 6.

4. Conclusion

Tools and Methodologies developed within the VLT Software Engineering Group have proved to be effective in supporting the VLT Software development. They can be seen as a concrete guideline and reference for all ESO internal projects and are proposed as baseline for all external collaborations.

This article is based on reports presented at ICALEPCS 99:

[1] G. Filippi, "Software Engineering for ESO's VLT project", *ICALEPCS* **93**.
[2] G. Filippi, F. Carbognani, "Software practices used in the ESO Very Large Telescope Control Software", *ICALEPCS* **99**.

E-mail: fcarbogn@eso.org